METHOD AND APPARATUS FOR PROVIDING HIGH BANDWIDTH, LOW NOISEMECHANICAL I/O FOR COMPUTER SYSTEMS

ABSTRACT OF THE DISCLOSURE

A method and apparatus for providing high bandwidth and low noise mechanical input and output for computer systems. A gimbal mechanism provides two revolute degrees of freedom to an object about two axes of rotation. A linear axis member is coupled to the gimbal mechanism at the intersection of the two axes of rotation. The linear axis member is capable of being translated along a third axis to provide a third degree of freedom. The user object is coupled to the linear axis member and is thus translatable along the third axis so that the object can be moved along all three degrees of freedom. Transducers associated with the provided degrees of freedom include sensors and actuators and provide an electromechanical interface between the object and a digital processing system. Capstan drive mechanisms transmit forces between the transducers and the object. The linear axis member can also be rotated about its lengthwise axis to provide a fourth degree of freedom, and, optionally, a floating gimbal mechanism is coupled to the linear axis member to provide fifth and sixth degrees of freedom to an object. Transducer sensors are associated with the fourth, fifth, and sixth degrees of freedom. The interface is well suited for simulations of medical procedures and simulations in which an object such as a stylus or a joystick is moved and manipulated by the user.